BENAZEPRIL HYDROCHLORIDE - benazepril hydrochloride tablet, film coated
Andrx Pharmaceuticals

Rx only

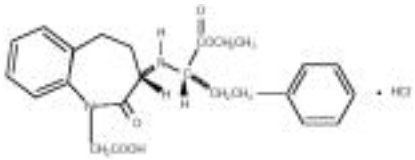
PRESCRIBING INFORMATION

Use in Pregnancy

When used in pregnancy during the second and third trimesters, ACE inhibitors can cause injury and even death to the developing fetus. When pregnancy is detected, benazepril hydrochloride tablets should be discontinued as soon as possible. See WARNINGS, Fetal/Neonatal Morbidity and Mortality.

DESCRIPTION

Benazepril hydrochloride is a white to off-white crystalline powder, soluble (>100 mg/mL) in water, in ethanol, and in methanol. Benazepril's chemical name is 3-[[1-(ethoxy-carbonyl)-3-phenyl-(1S)-propyl]amino]-2,3,4,5-tetrahydro-2-oxo-1*H*-1-(3S)-benzazepine-1-acetic acid monohydrochloride; its structural formula is



Its empirical formula is $C_{24}H_{28}N_2O_5 \cdot HCl$, and its molecular weight is 460.96.

Benazeprilat, the active metabolite of benazepril, is a non-sulfhydryl angiotensin-converting enzyme inhibitor. Benazepril is converted to benazeprilat by hepatic cleavage of the ester group. Benazepril hydrochloride tablets is supplied as tablets containing 5 mg, 10 mg, 20 mg, and 40 mg of benazepril hydrochloride for oral administration.

In addition, each tablet contains the following inactive ingredients:

5 mg	Colloidal silicon dioxide, crospovidone, D&C yellow #10 aluminum lake, FD&C yellow #6 aluminum lake, hypromellose, lactose monohydrate, magnesium stearate, microcrystalline cellulose, polydextrose, polyethylene glycol, pregelatinized starch, titanium dioxide, and triacetin.
10 mg	Colloidal silicon dioxide, crospovidone, D&C yellow #10 aluminum lake, FD&C yellow #6 aluminum lake, hypromellose, lactose monohydrate, magnesium stearate, microcrystalline cellulose, polydextrose, polyethylene glycol, pregelatinized starch, titanium dioxide, and triacetin.
20 mg	Colloidal silicon dioxide, crospovidone, FD&C red #40 aluminum lake, FD&C yellow #6 aluminum lake, hypromellose, lactose monohydrate, magnesium stearate, microcrystalline cellulose, polydextrose, polyethylene glycol, pregelatinized starch, titanium dioxide, and triacetin.
40 mg	Colloidal silicon dioxide, crospovidone, FD&C red # 40 aluminum lake, FD&C yellow #6 aluminum lake, hypromellose, lactose monohydrate, magnesium stearate, microcrystalline cellulose, polydextrose, polyethylene glycol, pregelatinized starch, titanium dioxide, and triacetin.

CLINICAL PHARMACOLOGY

Mechanism of Action

Benazepril and benazeprilat inhibit angiotensin-converting enzyme (ACE) in human subjects and animals. ACE is a peptidyl dipeptidase that catalyzes the conversion of angiotensin I to the vasoconstrictor substance, angiotensin II. Angiotensin II also stimulates aldosterone secretion by the adrenal cortex.

Inhibition of ACE results in decreased plasma angiotensin II, which leads to decreased vasopressor activity and to decreased aldosterone secretion. The latter decrease may result in a small increase of serum potassium.

Hypertensive patients treated with benazepril hydrochloride alone for up to 52 weeks had elevations of serum potassium of up to 0.2 mEq/L. Similar patients treated with benazepril hydrochloride and hydrochlorothiazide for up to 24 weeks had no consistent changes in their serum potassium (see **PRECAUTIONS)**.

Removal of angiotensin II negative feedback on renin secretion leads to increased plasma renin activity. In animal studies, benazepril had no inhibitory effect on the vasopressor response to angiotensin II and did not interfere with the hemodynamic effects of the autonomic neurotransmitters acetylcholine, epinephrine, and norepinephrine.

ACE is identical to kininase, an enzyme that degrades bradykinin. Whether increased levels of bradykinin, a potent vasodepressor peptide, play a role in the therapeutic effects of benazepril hydrochloride remains to be elucidated.

While the mechanism through which benazepril lowers blood pressure is believed to be primarily suppression of the renin-angiotensin-aldosterone system, benazepril has an antihypertensive effect even in patients with low-renin hypertension (see **INDICATIONS AND USAGE**).

Pharmacokinetics and Metabolism

Following oral administration of benazepril hydrochloride, peak plasma concentrations of benazepril are reached within 0.5-1.0 hours. The extent of absorption is at least 37% as determined by urinary recovery and is not significantly influenced by the presence of food in the GI tract.

Cleavage of the ester group (primarily in the liver) converts benazepril to its active metabolite, benazeprilat. Peak plasma concentrations of benazeprilat are reached 1-2 hours after drug intake in the fasting state and 2-4 hours after drug intake in the non-fasting state. The serum protein binding of benazepril is about 96.7% and that of benazeprilat about 95.3%, as measured by equilibrium dialysis; on the basis of *in vitro* studies, the degree of protein binding should be unaffected by age, hepatic dysfunction, or concentration (over the concentration range of 0.24-23.6 mol/L).

Benazepril is almost completely metabolized to benazeprilat, which has much greater ACE inhibitory activity than benazepril, and to the glucuronide conjugates of benazepril and benazeprilat. Only trace amounts of an administered dose of benazepril hydrochloride can be recovered in the urine as unchanged benazepril, while about 20% of the dose is excreted as benazeprilat, 4% as benazepril glucuronide, and 8% as benazeprilat glucuronide.

The kinetics of benazepril are approximately dose-proportional within the dosage range of 10-80 mg.

The effective half-life of accumulation of benazeprilat following multiple dosing of benazepril hydrochloride is 10-11 hours. Thus, steady-state concentrations of benazeprilat should be reached after 2 or 3 doses of benazepril hydrochloride given once daily.

The kinetics did not change, and there was no significant accumulation during chronic administration (28 days) of once-daily doses between 5 mg and 20 mg. Accumulation ratios based on AUC and urinary recovery of benazeprilat were 1.19 and 1.27, respectively.

When dialysis was started two hours after ingestion of 10 mg of benazepril, approximately 6% of benazeprilat was removed in 4 hours of dialysis. The parent compound, benazepril, was not detected in the dialysate.

The disposition of benazepril and benazeprilat in patients with mild-to-moderate renal insufficiency (creatinine clearance >30 mL/min) is similar to that in patients with normal renal function. In patients with creatinine clearance >30 mL/min, peak benazeprilat levels and the initial (alpha phase) half-life increase, and time to steady state may be delayed (see **DOSAGE AND ADMINISTRATION**).

Benazepril and benazeprilat are cleared predominantly by renal excretion in healthy subjects with normal renal function. Nonrenal (i.e., biliary) excretion accounts for approximately 11-12% of benazeprilat excretion in healthy subjects. In patients with renal failure, biliary clearance may compensate to an extent for deficient renal clearance.

In patients with hepatic dysfunction due to cirrhosis, levels of benazeprilat are essentially unaltered. The pharmacokinetics of benazepril and benazeprilat do not appear to be influenced by age.

In studies in rats given ^{14}C-benazepril, benazepril and its metabolites crossed the blood-brain barrier only to an extremely low extent. Multiple doses of benazepril did not result in accumulation in any tissue except the lung, where, as with other ACE inhibitors in similar studies, there was a slight increase in concentration due to slow elimination in that organ.

Some placental passage occurred when the drug was administered to pregnant rats.

Pharmacodynamics

Single and multiple doses of 10 mg or more of benazepril hydrochloride cause inhibition of plasma ACE activity by at least 80-90% for at least 24 hours after dosing. Pressor responses to exogenous angiotensin I were inhibited by 60-90% (up to 4 hours post-dose) at the 10-mg dose.

Administration of benazepril hydrochloride to patients with mild-to-moderate hypertension results in a reduction of both supine and standing blood pressure to about the same extent with no compensatory tachycardia. Symptomatic postural hypotension is infrequent, although it can occur in patients who are salt- and/or volume-depleted (see **WARNINGS**).

In single-dose studies, benazepril hydrochloride lowered blood pressure within 1 hour, with peak reductions achieved 2-4 hours after dosing. The antihypertensive effect of a single dose persisted for 24 hours. In multiple-dose studies, once-daily doses of 20-80 mg decreased seated pressure (systolic/diastolic) 24 hours after dosing by about 6-12/4-7 mmHg. The trough values represent reductions of about 50% of that seen at peak.

Four dose-response studies using once-daily dosing were conducted in 470 mild-to-moderate hypertensive patients not using diuretics. The minimal effective once-daily dose of benazepril hydrochloride was 10 mg; but further falls in blood pressure, especially at morning trough, were seen with higher doses in the studied dosing range (10-80 mg). In studies comparing the same daily dose of benazepril hydrochloride given as a single morning dose or as a twice-daily dose, blood pressure reductions at the time of morning trough blood levels were greater with the divided regimen.

During chronic therapy, the maximum reduction in blood pressure with any dose is generally achieved after 1-2 weeks. The antihypertensive effects of benazepril hydrochloride have continued during therapy for at least two years. Abrupt withdrawal of benazepril hydrochloride has not been associated with a rapid increase in blood pressure.

In patients with mild-to-moderate hypertension, benazepril hydrochloride 10-20 mg was similar in effectiveness to captopril, hydrochlorothiazide, nifedipine SR, and propranolol.

The antihypertensive effects of benazepril hydrochloride were not appreciably different in patients receiving high- or low-sodium diets.

In hemodynamic studies in dogs, blood pressure reduction was accompanied by a reduction in peripheral arterial resistance, with an increase in cardiac output and renal blood flow and little or no change in heart rate. In normal human volunteers, single doses of benazepril caused an increase in renal blood flow but had no effect on glomerular filtration rate.
Use of benazepril hydrochloride in combination with thiazide diuretics gives a blood-pressure-lowering effect greater than that seen with either agent alone. By blocking the renin-angiotensin-aldosterone axis, administration of benazepril hydrochloride tends to reduce the potassium loss associated with the diuretic.

INDICATIONS AND USAGE
Benazepril hydrochloride tablets are indicated for the treatment of hypertension. It may be used alone or in combination with thiazide diuretics.
In using benazepril hydrochloride, consideration should be given to the fact that another angiotensin-converting enzyme inhibitor, captopril, has caused agranulocytosis, particularly in patients with renal impairment or collagen-vascular disease. Available data are insufficient to show that benazepril hydrochloride does not have a similar risk (see **WARNINGS**).
Black patients receiving ACE-inhibitor monotherapy have been reported to have a higher incidence of angioedema compared to nonblacks. It should also be noted that in controlled clinical trials ACE inhibitors have an effect on blood pressure that is less in black patients than in nonblacks.

CONTRAINDICATIONS
Benazepril hydrochloride tablets are contraindicated in patients who are hypersensitive to this product or to any other ACE inhibitor.

WARNINGS

Anaphylactoid and Possibly Related Reactions
Presumably because angiotensin-converting inhibitors affect the metabolism of eicosanoids and polypeptides, including endogenous bradykinin, patients receiving ACE inhibitors (including benazepril hydrochloride) may be subject to a variety of adverse reactions, some of them serious.
Head and Neck Angioedema: Angioedema of the face, extremities, lips, tongue, glottis, and larynx has been reported in patients treated with angiotensin-converting enzyme inhibitors. In U.S. clinical trials, symptoms consistent with angioedema were seen in none of the subjects who received placebo and in about 0.5% of the subjects who received benazepril hydrochloride. Angioedema associated with laryngeal edema can be fatal. If laryngeal stridor or angioedema of the face, tongue, or glottis occurs, treatment with benazepril hydrochloride should be discontinued and appropriate therapy instituted immediately. **Where there is involvement of the tongue, glottis, or larynx, likely to cause airway obstruction, appropriate therapy, e.g., subcutaneous epinephrine injection 1:1000 (0.3 mL to 0.5 mL) should be promptly administered** (see **ADVERSE REACTIONS**).

Intestinal Angiodema: : Intestinal angioedema has been reported in patients treated with ACE inhibitors. These patients presented with abdominal pain (with or without nausea or vomiting); in some cases there was no prior history of facial angioedema anc C-1 esterase levels were normal. The angioedema was diagnosed by procedures including abdominal CT scan or ultrasound, or at surgery, and symptoms resolved after stopping the ACE inhibitor. Intestinal angioedema should be included in the differential diagnosis of patients on ACE inhibitors presenting with abdominal pain.

Anaphylactoid Reactions During Desensitization: Two patients undergoing desensitizing treatment with hymenoptera venom while receiving ACE inhibitors sustained life-threatening anaphylactoid reactions. In the same patients, these reactions were avoided when ACE inhibitors were temporarily withheld, but they reappeared upon inadvertent rechallenge.

Anaphylactoid Reactions During Membrane Exposure: Anaphylactoid reactions have been reported in patients dialyzed with high-flux membranes and treated concomitantly with an ACE inhibitor. Anaphylactoid reactions have also been reported in patients undergoing low-density lipoprotein apheresis with dextran sulfate absorption (a procedure dependent upon devices not approved in the United States).

Hypotension
Benazepril hydrochloride can cause symptomatic hypotension. Like other ACE inhibitors, benazepril has been only rarely associated with hypotension in uncomplicated hypertensive patients. Symptomatic hypotension is most likely to occur in patients who have been volume- and/or salt-depleted as a result of prolonged diuretic therapy, dietary salt restriction, dialysis, diarrhea, or vomiting. Volume- and/or salt-depletion should be corrected before initiating therapy with benazepril hydrochloride.
In patients with congestive heart failure, with or without associated renal insufficiency, ACE inhibitor therapy may cause excessive hypotension, which may be associated with oliguria or azotemia and, rarely, with acute renal failure and death. In such patients, benazepril hydrochloride therapy should be started under close medical supervision; they should be followed closely for the first 2 weeks of treatment and whenever the dose of benazepril or diuretic is increased.
If hypotension occurs, the patient should be placed in a supine position, and, if necessary, treated with intravenous infusion of physiological saline. Benazepril hydrochloride treatment usually can be continued following restoration of blood pressure and volume.

Neutropenia/Agranulocytosis
Another angiotensin-converting enzyme inhibitor, captopril, has been shown to cause agranulocytosis and bone marrow depression, rarely in uncomplicated patients, but more frequently in patients with renal impairment, especially if they also have a collagen-vascular disease such as systemic lupus erythematosus or scleroderma. Available data from clinical trials or benazepril are insufficient to show that benazepril does not cause agranulocytosis at similar rates. Monitoring of white blood cell counts should be considered in patients with collagen-vascular disease, especially if the disease is associated with impaired renal function.

Fetal/Neonatal Morbidity and Mortality
ACE inhibitors can cause fetal and neonatal morbidity and death when administered to pregnant women. Several dozen cases have been reported in the world literature. When pregnancy is detected, ACE inhibitors should be discontinued as soon as possible.
The use of ACE inhibitors during the second and third trimesters of pregnancy has been associated with fetal and neonatal injury, including hypotension, neonatal skull hypoplasia, anuria, reversible or irreversible renal failure, and death. Oligohydramnios has also been reported, presumably resulting from decreased fetal renal function; oligohydramnios in this setting has been associated with fetal limb contractures, craniofacial deformation, and hypoplastic lung development. Prematurity, intrauterine growth retardation, and patent ductus arteriosus have also been reported, although it is not clear whether these occurrences were due to the ACE inhibitor exposure.
These adverse effects do not appear to have resulted from intrauterine ACE inhibitor exposure that has been limited to the first trimester. Mothers whose embryos and fetuses are exposed to ACE inhibitors only during the first trimester should be so informed. Nonetheless, when patients become pregnant, physicians should make every effort to discontinue the use of benazepril as soon as possible.
Rarely (probably less often than once in every thousand pregnancies), no alternative to ACE inhibitors will be found. In these rare cases, the mothers should be apprised of the potential hazards to their fetuses, and serial ultrasound examinations should be performed to assess the intraamniotic environment.
If oligohydramnios is observed, benazepril should be discontinued unless it is considered life-saving for the mother. Contraction stress testing (CST), a nonstress test (NST), or biophysical profiling (BPP) may be appropriate, depending upon the week of pregnancy. Patients and physicians should be aware, however, that oligohydramnios may not appear until after the fetus has sustained irreversible injury.

> Infants with histories of in utero exposure to ACE inhibitors should be closely observed for hypotension, oliguria, and hyperkalemia. If oliguria occurs, attention should be directed toward support of blood pressure and renal perfusion. Exchange transfusion or dialysis may be required as means of reversing hypotension and/or substituting for disordered renal function.

Benazepril, which crosses the placenta, can theoretically be removed from the neonatal circulation by these means; there are occasional reports of benefit from these maneuvers with another ACE inhibitor, but experience is limited.

No teratogenic effects of benazepril hydrochloride were seen in studies of pregnant rats, mice, and rabbits. On a mg/m^2 basis, the doses used in these studies were 60 times (in rats), 9 times (in mice), and more than 0.8 times (in rabbits) the maximum recommended human dose (assuming a 50-kg woman). On a mg/kg basis these multiples are 300 times (in rats), 90 times (in mice) and more than 3 times (in rabbits) the maximum recommended human dose.

Hepatic Failure
Rarely, ACE inhibitors have been associated with a syndrome that starts with cholestatic jaundice and progresses to fulminant hepatic necrosis and (sometimes) death. The mechanism of this syndrome is not understood. Patients receiving ACE inhibitors who develop jaundice or marked elevations of hepatic enzymes should discontinue the ACE inhibitor and receive appropriate medical follow-up.

PRECAUTIONS

General
Impaired Renal Function: As a consequence of inhibiting the renin-angiotensin-aldosterone system, changes in renal function may be anticipated in susceptible individuals. In patients with severe congestive heart failure whose renal function may depend on the activity of the renin-angiotensin-aldosterone system, treatment with angiotensin-converting enzyme inhibitors, including benazepril hydrochloride, may be associated with oliguria and/or progressive azotemia and (rarely) with acute renal failure and/or death. In a small study of hypertensive patients with renal artery stenosis in a solitary kidney or bilateral renal artery stenosis, treatment with benazepril hydrochloride was associated with increases in blood urea nitrogen and serum creatinine; these increases were reversible upon discontinuation of benazepril hydrochloride or diuretic therapy, or both. When such patients are treated with ACE inhibitors, renal function should be monitored during the first few weeks of therapy. Some hypertensive patients with no apparent preexisting renal vascular disease have developed increases in blood urea nitrogen and serum creatinine, usually minor and transient, especially when benazepril hydrochloride has been given concomitantly with a diuretic. This is more likely to occur in patients with preexisting renal impairment. Dosage reduction of benazepril hydrochloride and/or discontinuation of the diuretic may be required. **Evaluation of the hypertensive patient should always include assessment of renal function** (see **DOSAGE AND ADMINISTRATION**).

Hyperkalemia: In clinical trials, hyperkalemia (serum potassium at least 0.5 mEq/L greater than the upper limit of normal) occurred in approximately 1% of hypertensive patients receiving benazepril hydrochloride. In most cases, these were isolated values which resolved despite continued therapy. Risk factors for the development of hyperkalemia include renal insufficiency, diabetes mellitus, and the concomitant use of potassium-sparing diuretics, potassium supplements, and/or potassium-containing salt substitutes, which should be used cautiously, if at all, with benazepril hydrochloride (see **Drug Interactions**).

Cough: Presumably due to the inhibition of the degradation of endogenous bradykinin, persistent nonproductive cough has been reported with all ACE inhibitors, always resolving after discontinuation of therapy. ACE inhibitor-induced cough should be considered in the differential diagnosis of cough.

Impaired Liver Function: In patients with hepatic dysfunction due to cirrhosis, levels of benazeprilat are essentially unaltered (see **WARNINGS, Hepatic Failure**).

Surgery/Anesthesia: In patients undergoing surgery or during anesthesia with agents that produce hypotension, benazepril will block the angiotensin II formation that could otherwise occur secondary to compensatory renin release. Hypotension that occurs as a result of this mechanism can be corrected by volume expansion.

Information for Patients

Pregnancy: Female patients of childbearing age should be told about the consequences of second- and third-trimester exposure to ACE inhibitors, and they should also be told that these consequences do not appear to have resulted from intrauterine ACE inhibitor exposure that has been limited to the first trimester. These patients should be asked to report pregnancies to their physicians as soon as possible.

Angioedema: Angioedema, including laryngeal edema, can occur at any time with treatment with ACE inhibitors. Patients should be so advised and told to report immediately any signs or symptoms suggesting angioedema (swelling of face, eyes, lips, or tongue, or difficulty in breathing) and to take no more drug until they have consulted with the prescribing physician.

Symptomatic Hypotension: Patients should be cautioned that lightheadedness can occur, especially during the first days of therapy, and it should be reported to the prescribing physician. Patients should be told that if syncope occurs, benazepril hydrochloride should be discontinued until the prescribing physician has been consulted.

All patients should be cautioned that inadequate fluid intake or excessive perspiration, diarrhea, or vomiting can lead to an excessive fall in blood pressure, with the same consequences of lightheadedness and possible syncope.

Hyperkalemia: Patients should be told not to use potassium supplements or salt substitutes containing potassium without consulting the prescribing physician.

Neutropenia: Patients should be told to promptly report any indication of infection (e.g., sore throat, fever), which could be a sign of neutropenia.

Drug Interactions

Diuretics: Patients on diuretics, especially those in whom diuretic therapy was recently instituted, may occasionally experience an excessive reduction of blood pressure after initiation of therapy with benazepril hydrochloride. The possibility of hypotensive effects with benazepril hydrochloride can be minimized by either discontinuing the diuretic or increasing the salt intake prior to initiation of treatment with benazepril hydrochloride. If this is not possible, the starting dose should be reduced (see **DOSAGE AND ADMINISTRATION**).

Potassium Supplements and Potassium-Sparing Diuretics: Benazepril hydrochloride can attenuate potassium loss caused by thiazide diuretics. Potassium-sparing diuretics (spironolactone, amiloride, triamterene, and others) or potassium supplements can increase the risk of hyperkalemia. Therefore, if concomitant use of such agents is indicated, they should be given with caution, and the patient's serum potassium should be monitored frequently.

Oral Anticoagulants: Interaction studies with warfarin and acenocoumarol failed to identify any clinically important effects on the serum concentrations or clinical effects of these anticoagulants.

Lithium: Increased serum lithium levels and symptoms of lithium toxicity have been reported in patients receiving ACE inhibitors during therapy with lithium. These drugs should be coadministered with caution, and frequent monitoring of serum lithium levels is recommended. If a diuretic is also used, the risk of lithium toxicity may be increased.

Other: No clinically important pharmacokinetic interactions occurred when benazepril hydrochloride was administered concomitantly with hydrochlorothiazide, chlorthalidone, furosemide, digoxin, propranolol, atenolol, naproxen, or cimetidine.

Benazepril hydrochloride has been used concomitantly with beta-adrenergic-blocking agents, calcium-channel-blocking agents, diuretics, digoxin, and hydralazine, without evidence of clinically important adverse interactions. Benazepril, like other ACE inhibitors, has had less than additive effects with beta-adrenergic blockers, presumably because both drugs lower blood pressure by inhibiting parts of the renin-angiotensin system.

Carcinogenesis, Mutagenesis, and Impairment of Fertility:
No evidence of carcinogenicity was found when benazepril was administered to rats and mice for up to two years at doses of up to 150 mg/kg/day. When compared on the basis of body weights, this dose is 110 times the maximum recommended human dose. When compared on the basis to body surface areas, this dose is 18 and 9 times (rats and mice, respectively) the maximum recommended human dose (calculations assume a patient weight of 60 kg). No mutagenic activity was detected in the Ames test in bacteria (with or without metabolic activation), in an *in vitro* test for forward mutations in cultured mammalian cells, or in a nucleus anomaly test.
In doses of 50-500 mg/kg/day (6-60 times the maximum recommended human dose based on mg/m^2 comparison and 37-375 times the maximum recommended human dose based on a mg/kg comparison), benazepril hydrochloride had no adverse effect on the reproductive performance of male and female rats.

Pregnancy Categories C (first trimester) and D (second and third trimesters)
See **WARNINGS, Fetal/Neonatal Morbidity and Mortality**.

Nursing Mothers
Minimal amounts of unchanged benazepril and of benazeprilat are excreted into the breast milk of lactating women treated with benazepril. A newborn child ingesting entirely breast milk would receive less than 0.1% of the mg/kg maternal dose of benazepril and benazeprilat.

Geriatric Use
Of the total number of patients who received benazepril in U.S. clinical studies of benazepril hydrochloride, 18% were 65 or older while 2% were 75 or older. No overall differences in effectiveness or safety were observed between these patients and younger patients, and other reported clinical experience has not identified differences in responses between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out.
Benazepril and benazeprilat are substantially excreted by the kidney. Because elderly patients are more likely to have decreased renal function, care should be taken in dose selection, and it may be useful to monitor renal function.

Pediatric Use
Safety and effectiveness in children have not been established.

ADVERSE REACTIONS
Benazepril hydrochloride has been evaluated for safety in over 6000 patients with hypertension; over 700 of these patients were treated for at least one year. The overall incidence of reported adverse events was comparable in benazepril hydrochloride and placebo patients.
The reported side effects were generally mild and transient, and there was no relation between side effects and age, duration of therapy, or total dosage within the range of 2 to 80 mg.
Discontinuation of therapy because of a side effect was required in approximately 5% of U.S. patients treated with benazepril hydrochloride and in 3% of patients treated with placebo.
The most common reasons for discontinuation were headache (0.6%) and cough (0.5%) (see **PRECAUTIONS, Cough**).
The side effects considered possibly or probably related to study drug that occurred in U.S. placebo-controlled trials in more than 1% of patients treated with benazepril hydrochloride are shown below.

PATIENTS IN U.S. PLACEBO-CONTROLLED STUDIES				
	BENAZEPRIL HYDROCHLORIDE (N=964)		**PLACEBO (N=496)**	
	N	**%**	**N**	**%**
Headache	60	6.2	21	4.2
Dizziness	35	3.6	12	2.4
Fatigue	23	2.4	11	2.2
Somnolence	15	1.6	2	0.4
Postural Dizziness	14	1.5	1	0.2
Nausea	13	1.3	5	1.0
Cough	12	1.2	5	1.0

Other adverse experiences reported in controlled clinical trials (in less than 1% of benazepril patients), and rarer events seen in postmarketing experience, include the following (in some, a causal relationship to drug use is uncertain):
Cardiovascular: Symptomatic hypotension was seen in 0.3% of patients, postural hypotension in 0.4%, and syncope in 0.1%; these reactions led to discontinuation of therapy in 4 patients who had received benazepril monotherapy and in 9 patients who had received benazepril with hydrochlorothiazide (see **PRECAUTIONS** and **WARNINGS**). Other reports included angina pectoris, palpitations, and peripheral edema.
Renal: Of hypertensive patients with no apparent preexisting renal disease, about 2% have sustained increases in serum creatinine to at least 150% of their baseline values while receiving benazepril hydrochloride, but most of these increases have disappeared despite continuing treatment. A much smaller fraction of these patients (less than 0.1%) developed simultaneous (usually transient) increases in blood urea nitrogen and serum creatinine.
Fetal/Neonatal Morbidity and Mortality: See **WARNINGS, Fetal/Neonatal Morbidity and Mortality**.
Angioedema: Angioedema has been reported in patients receiving ACE inhibitors. During clinical trials in hypertensive patients with benazepril, 0.5% of patients experienced edema of the lips or face without other manifestations of angioedema. Angioedema associated with laryngeal edema and/or shock may be fatal. If angioedema of the face, extremities, lips, tongue, or glottis and/or larynx occurs, treatment with benazepril hydrochloride should be discontinued and appropriate therapy instituted immediately (see **WARNINGS**).
Dermatologic: Stevens-Johnson syndrome, pemphigus, apparent hypersensitivity reactions (manifested by dermatitis, pruritus, or rash), photosensitivity, and flushing.
Gastrointestinal: Pancreatitis, constipation, gastritis, vomiting, and melena.
Hematologic: Thrombocytopenia and hemolytic anemia.
Neurologic and Psychiatric: Anxiety, decreased libido, hypertonia, insomnia, nervousness, and paresthesia.
Other: Alopecia, arthralgia, arthritis, asthenia, asthma, bronchitis, dyspnea, impotence, infection, myalgia, sinusitis, sweating and urinary tract infection. Another potentially important adverse experience, eosinophilic pneumonitis, has been attributed to other ACE inhibitors.

Clinical Laboratory Test Findings
Creatinine and Blood Urea Nitrogen: Of hypertensive patients with no apparent pre-existing renal disease, about 2% have sustained increases in serum creatinine to at least 150% of their baseline values while receiving benazepril hydrochloride, but most of these increases have disappeared despite continuing treatment. A much smaller fraction of these patients (less than 0.1%) developed simultaneous (usually transient) increases in blood urea nitrogen and serum creatinine. None of these increases required discontinuation of treatment. Increases in these laboratory values are more likely to occur in patients with renal insufficiency or those pretreated with a diuretic and, based on experience with other ACE inhibitors, would be expected to be especially likely in patients with renal artery stenosis (see **PRECAUTIONS, General**).

Potassium: Since benazepril decreases aldosterone secretion, elevation of serum potassium can occur. Potassium supplements and potassium-sparing diuretics should be given with caution, and the patient's serum potassium should be monitored frequently (see **PRECAUTIONS**).

Hemoglobin: Decreases in hemoglobin (a low value and a decrease of 5 g/dL) were rare, occurring in only 1 of 2014 patients receiving benazepril hydrochloride alone and in 1 of 1357 patients receiving benazepril hydrochloride plus a diuretic. No U.S. patients discontinued treatment because of decreases in hemoglobin.

Other (causal relationships unknown): Clinically important changes in standard laboratory tests were rarely associated with benazepril hydrochloride administration.

Elevations of uric acid, blood glucose, serum bilirubin, and liver enzymes (see **WARNINGS**) have been reported, as have scattered incidents of hyponatremia, electrocardiographic changes, leukopenia, eosinophilia, and proteinuria. In U.S. trials, less than 0.5% of patients discontinued treatment because of laboratory abnormalities.

OVERDOSAGE
Single oral doses of 3 g/kg benazepril were associated with significant lethality in mice. Rats however, tolerated single oral doses of up to 6 g/kg. Reduced activity was seen at 1 g/kg in mice and at 5 g/kg in rats. Human overdoses of benazepril have not been reported, but the most common manifestation of human benazepril overdosage is likely to be hypotension.
Laboratory determinations of serum levels of benazepril and its metabolites are not widely available, and such determinations have, in any event, no established role in the management of benazepril overdose.
No data are available to suggest physiological maneuvers (e.g., maneuvers to change the pH of the urine) that might accelerate elimination of benazepril and its metabolites. Benazepril is only slightly dialyzable, but dialysis might be considered in overdosed patients with severely impaired renal function (see **WARNINGS**).

Angiotensin II could presumably serve as a specific antagonist-antidote in the setting of benazepril overdose, but angiotensin II is essentially unavailable outside of scattered research facilities. Because the hypotensive effect of benazepril is achieved through vasodilation and effective hypovolemia, it is reasonable to treat benazepril overdose by infusion of normal saline solution.

DOSAGE AND ADMINISTRATION

The recommended initial dose for patients not receiving a diuretic is 10 mg once-a-day. The usual maintenance dosage range is 20-40 mg per day administered as a single dose or in two equally divided doses. A dose of 80 mg gives an increased response, but experience with this dose is limited. The divided regimen was more effective in controlling trough (pre-dosing) blood pressure than the same dose given as a once-daily regimen. Dosage adjustment should be based on measurement of peak (2-6 hours after dosing) and trough responses. If a once-daily regimen does not give adequate trough response an increase in dosage or divided in dosage or divided administration should be considered. If blood pressure is not controlled with benazepril hydrochloride tablets alone, a diuretic can be added.

Total daily doses above 80 mg have not been evaluated.

Concomitant administration of benazepril hydrochloride tablets with potassium supplements, potassium salt substitutes, or potassium-sparing diuretics can lead to increases of serum potassium (see **PRECAUTIONS**).

In patients who are currently being treated with a diuretic, symptomatic hypotension occasionally can occur following the initial dose of benazepril hydrochloride tablets. To reduce the likelihood of hypotension, the diuretic should, if possible, be discontinued two to three days prior to beginning therapy with benazepril hydrochloride tablets (see **WARNINGS**). Then, if blood pressure is not controlled with benazepril hydrochloride tablets alone, diuretic therapy should be resumed.

If the diuretic cannot be discontinued, an initial dose of 5 mg benazepril hydrochloride tablets should be used to avoid excessive hypotension.

Dosage Adjustment in Renal Impairment

For patients with a creatinine clearance <30 mL/min/1.73 m^2 (serum creatinine >3 mg/dL), the recommended initial dose is 5 mg benazepril hydrochloride tablets once daily. Dosage may be titrated upward until blood pressure is controlled or to a maximum total daily dose of 40 mg (see **WARNINGS**).

HOW SUPPLIED

Benazepril hydrochloride tablets 5 mg are **light orange, round, film coated tablets imprinted with ⛰on one side and "516" imprinted on the other side.**

Bottles of 100 Tablets NDC 62037-516-01
Bottles of 1000 Tablets NDC 62037-516-10

Benazepril hydrochloride tablets 10 mg are **orange, round, film coated tablets imprinted with ⛰on one side and "517" imprinted on the other side.**

Bottles of 100 Tablets NDC 62037-517-01
Bottles of 1000 Tablets NDC 62037-517-10

Benazepril hydrochloride tablets 20 mg are **peach, round, film coated tablets imprinted with ⛰on one side and "518" imprinted on the other side.**

Bottles of 100 Tablets NDC 62037-518-01
Bottles of 1000 Tablets NDC 62037-518-10

Benazepril hydrochloride tablets 40 mg are **orange-red, round, film coated tablets imprinted with the ⛰on one side and "519" imprinted on the other side.**

Bottles of 100 Tablets NDC 62037-519-01
Bottles of 1000 Tablets NDC 62037-519-10

Storage: Do not store above 30° C (86° F). Protect from moisture.

Dispense in tight container (USP).

Manufactured by:

Andrx Pharmaceuticals
Ft. Lauderdale, FL 33314
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